Department for Education

Relationship between reception baseline assessment and key stage 1 attainment

Ad-hoc notice

September 2019

Contents

Introduction

The Reception Baseline Assessment (RBA) is a new national assessment that will be administered in all state-funded primary, infant and first schools in England to children in reception classes. It is intended to be introduced on a statutory basis from the autumn of 2020. The new assessment will enable us to create school-level progress measures for primary schools which show the progress pupils make from reception until the end of key stage 2 (KS2).

The focus of this ad-hoc notice is on the 70,000 pupils who participated in the 2015 optional RBA offered by the National Foundation for Educational Research (NFER). Whilst this cohort of pupils is yet to reach KS2, they took their key stage 1 (KS1) teacher assessments in the summer of 2018 and, as a result, we can investigate the relationship between their RBA and KS1 results. Of the around 70,000 pupils who participated in the NFER RBA, around 67,000 pupils (96%) have valid KS1 results and are included in this analysis.

Main findings

- The relationship between a high RBA mark and KS1 outcomes was statistically significant for all three KS1 teacher assessments in our analysis, in an analysis of variance (ANOVA) test.
- A statistically significant relationship between a high RBA mark and the probability of reaching the expected standard in all three KS1 teacher assessments in our analysis was observed in a binary logistic regression analysis.

Methodology

This analysis is based on attainment data from pupils who participated in the NFER RBA, covering pupils in reception in the academic year 2014/15 only. The RBA results use standardised marks that range from 69 to 141, with a mean of around 100 and a standard deviation of around 15.[1] The standard deviation is a measure used to quantify the amount of variation in a set of data values: 65% of pupils achieved a mark within one standard deviation of the mean (between 85 and 115) and 93% of pupils achieved a mark within two standard deviations of the mean (between 70 and 129).

These results have been matched with the pupils' KS1 attainment results from the academic year 2017/18.

[1] The total number of raw marks in the 2015 optional RBA was 95, and raw marks are converted to produce a mark that is on a standardised scale. The new RBA is modelled on the previous assessment however it is different and a raw mark of 45 is the maximum that can be achieved.

At the end of KS1 (year 2), teacher assessment judgements in reading, writing, maths and science are reported for each pupil. Teacher assessments are based on a broad range of evidence across the curriculum and knowledge of how a pupil has performed over time and in a variety of contexts. Teacher assessments in reading, writing and maths are used to analyse the relationship between the RBA and KS1.

This analysis uses an analysis of variance (ANOVA) and a binary logistic regression to test the relationship between RBA marks and KS1 outcomes.

A one-way ANOVA is used to determine whether there are any statistically significant differences between the means of two or more independent groups. Therefore, in this case it was used to understand whether mean RBA mark differed between the various KS1 outcomes.[2]

A binary logistic regression is a statistical technique used to predict the relationship between predictors and a dependent variable where the dependent variable is binary, expressed in this analysis as an odds ratio. If the resulting regression has a high degree of fit, is accurate, sensitive and specific, we can conclude the two variables share a relationship and are correlated. A statistically significant odds ratio greater than one shows increased odds of reaching the expected standard in a KS1 assessment, and an odds ratio of less than one shows decreased odds of reaching the expected standard.

There was a separate binary logistic regression ran for each KS1 subject, and KS1 results were converted into dummy variables.[3] A value of 1 indicates the pupil met the expected standard (or was working at greater depth). A value of 0 indicates the pupil did not meet the expected standard. The RBA was the only independent variable used in the regression models.

[2] The five KS1 outcomes include: below the pre-key stage standard (BLW), foundations for the expected standard (PKF), working towards the expected standard (WTS), working at the expected standard (EXS) and working at greater depth within the expected standard (GDS). The PKF comes from the interim pre-key stage standards that were superseded by the revised pre-key stage standards that are in use from the 2018/19 academic year onwards.

3 An ordinal logistic regression was also carried out using the five KS1 outcomes. The results were statistically significant and similar to the binary logistic regression.

Findings

Table 1 outlines the number of pupils who participated in the RBA, and the % of pupils who also have valid KS1 results. Of the 70,000 pupils who participated in the NFER RBA, 67,000 pupils (96%) have valid KS1 results and are included in this analysis.

RBA provider	Number of pupils	% with KS1 result
NFER	69,640	96%

Table 1: Number of pupils who participated in the 2015 NFER RBA

Source: NFER Reception results, 2015 and KS1 attainment data, 2018

As observed in Figures 1, 2 and 3, the RBA mean and median mark increase as KS1 results increase,[4] showing a positive relationship between the two. This is observed for KS1 reading, writing and mathematics results.

To explore the differences in RBA mark between the KS1 assessment groups further, a one-way ANOVA was carried out for each KS1 assessment in our analysis, and the calculated F-values of the three KS1 assessments are statistically significant (Table 2). We carried out further post-hoc tests to confirm that each KS1 category was also significantly different from the others.[5] This analysis shows that the difference in RBA mark between the KS1 outcomes is statistically significant for the three assessments we have looked at, and this provides support for the relationship between RBA mark and KS1 results.

4 The red dot and number shown on the box plots represents the mean, and the line within the box represents the median. The two lines that make up the rectangular box are the upper and lower quartile, whilst the black dots are the outliers.

5 Tukey post-hoc comparisons tests were used and all combinations have a p value <0.0001.

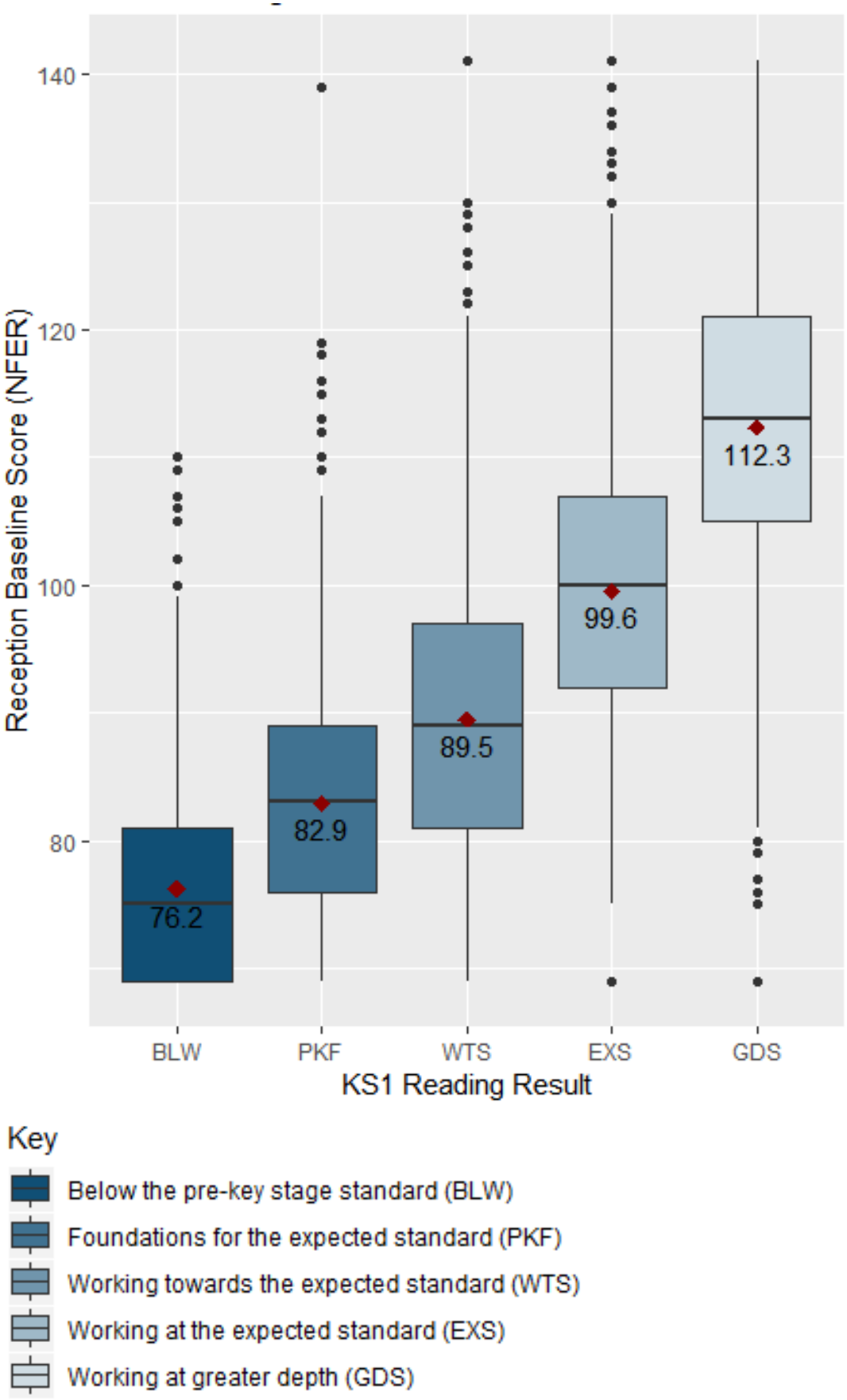

Figure 1: RBA mark distribution by KS1 reading results

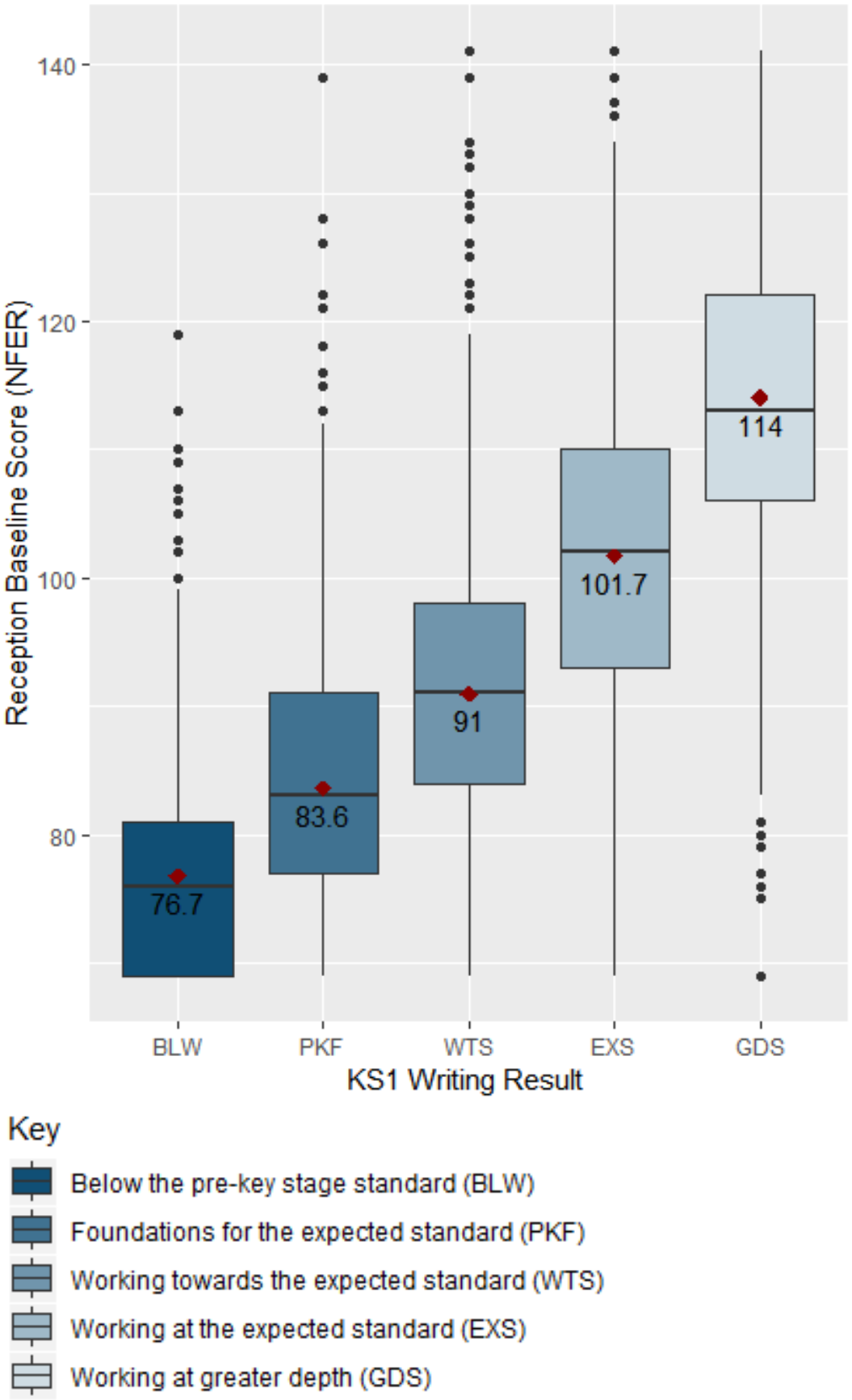

Figure 2: RBA mark distribution by KS1 writing results

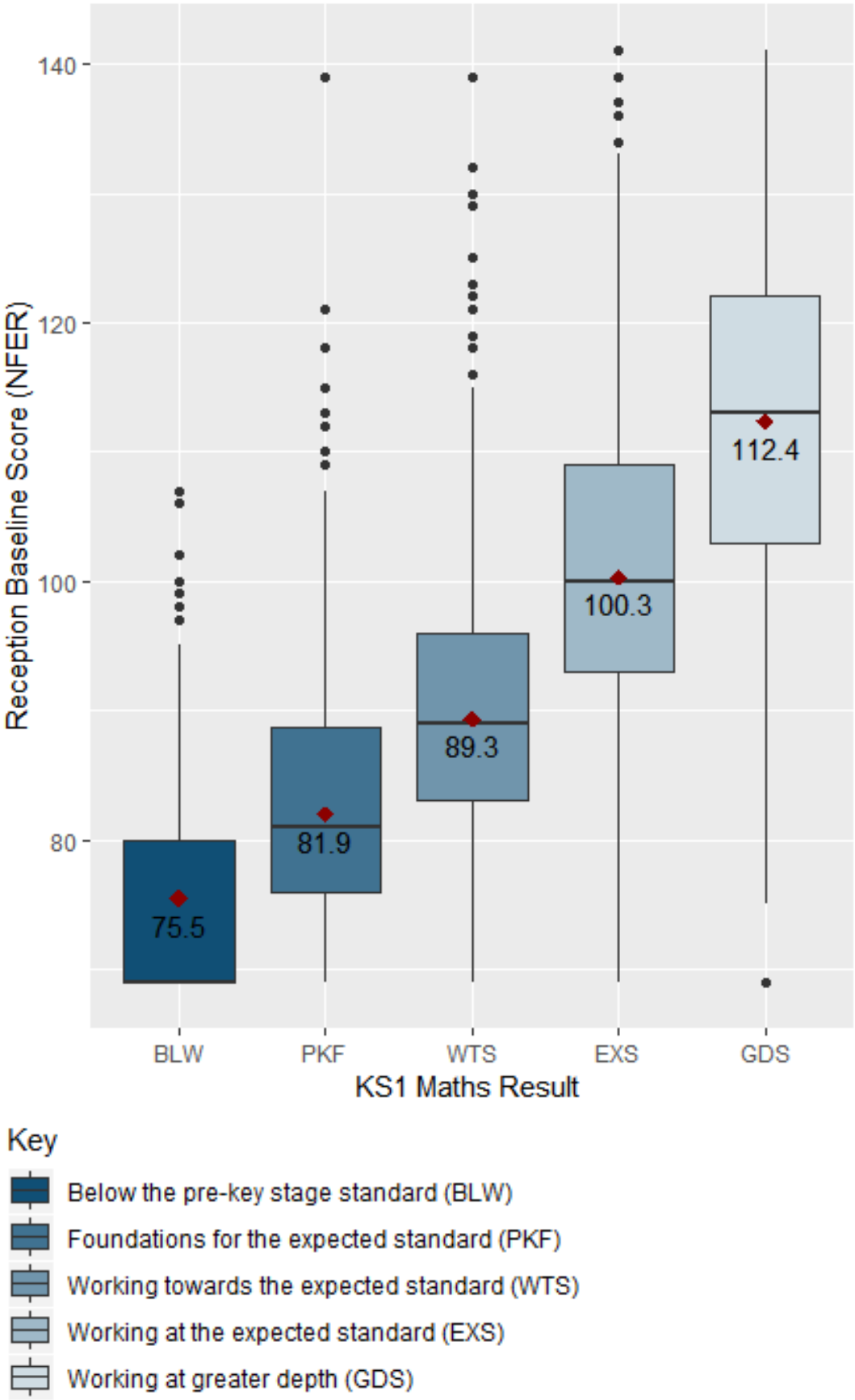

Figure 3: RBA mark distribution by KS1 mathematics results

In order to test this relationship further, a binary logistic regression was carried out. The regression models produced the following statistically significant results (see Tables 3-6 for full details of the odds ratio):

- **The chances of reaching the expected standard in reading increased with RBA mark.** For every unit increase in RBA mark, the odds of reaching the expected standard in reading increased by roughly a tenth.
- **The chances of reaching the expected standard in writing increased with RBA mark**. For every unit increase in RBA mark, the odds of reaching the expected standard in writing increased by roughly a tenth.
- **The chances of reaching the expected standard in mathematics increased with RBA mark**. For every unit increase in RBA mark, the odds of reaching the expected standard in mathematics increased by roughly a tenth.
- **The chances of reaching the expected standard in all three assessments (reading, writing and mathematics) increased with RBA mark.** For every unit increase in RBA mark, the odds of reaching the expected standard in all three teacher assessments increased by roughly a tenth.
- Numerous goodness of fit measures[6] were carried out and all indicate the regression models are a good fit.

[6] These included a Hosmer-Lemeshow test, and analysis of McFadden's R squared.

Tables

	Sum of Squares	Degrees of freedom	Mean squares	F value
KS1 writing result	4816382	4	1204096	8456***
KS1 reading result	5236987	4	1309247	9626***
KS1 mathematics result	4857716	4	1214429	8568***

*p<0.05; **p<0.01; ***p<0.001

Table 2: One-way ANOVA between RBA mark and KS1 attainment

Source: NFER Reception pilot results, 2015 and KS1 attainment data, 2018.

Notes: Number of pupils 66,600

Variables in the model	Odds Ratio	S.E.	Logits
RBA mark	1.10***	0.00	0.10
Constant	0.00	0.08	-8.84

*p<0.05; **p<0.01; ***p<0.001

Table 3: Logistic regression model predicting achieving the expected standard in all three KS1 assessments (reading, writing, mathematics)

Source: NFER Reception results, 2015 and KS1 attainment data, 2018

Notes: Number of pupils 66,600

Variables in the model	Odds Ratio	S.E.	Logits
RBA mark	1.11***	0.00	0.10
Constant	0.00	0.09	-8.67

*p<0.05; **p<0.01; ***p<0.001

Table 4: Logistic regression model predicting achieving the expected standard in KS1 reading assessment

Source: NFER Reception results, 2015 and KS1 attainment data, 2018

Notes: Number of pupils 66,600

Variables in the model	Odds Ratio	S.E.	Logits
RBA mark	1.10***	0.00	0.10
Constant	0.00	0.08	-8.40

*p<0.05; **p<0.01; ***p<0.001

Table 5: Logistic regression model predicting achieving the expected standard in KS1 writing assessment

Source: NFER Reception results, 2015 and KS1 attainment data, 2018

Notes: Number of pupils 66,600

Variables in the model	Odds Ratio	S.E.	Logits
RBA mark	1.11***	0.00	0.10
Constant	0.00	0.09	-8.58

*p<0.05; **p<0.01; ***p<0.001

Table 6: Logistic regression model predicting achieving the expected standard in KS1 mathematics assessment

Source: NFER Reception results, 2015 and KS1 attainment data, 2018

Notes: Number of pupils 66,600

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